Southeast Fisheries Science Center

Protected Resources Science Program Review

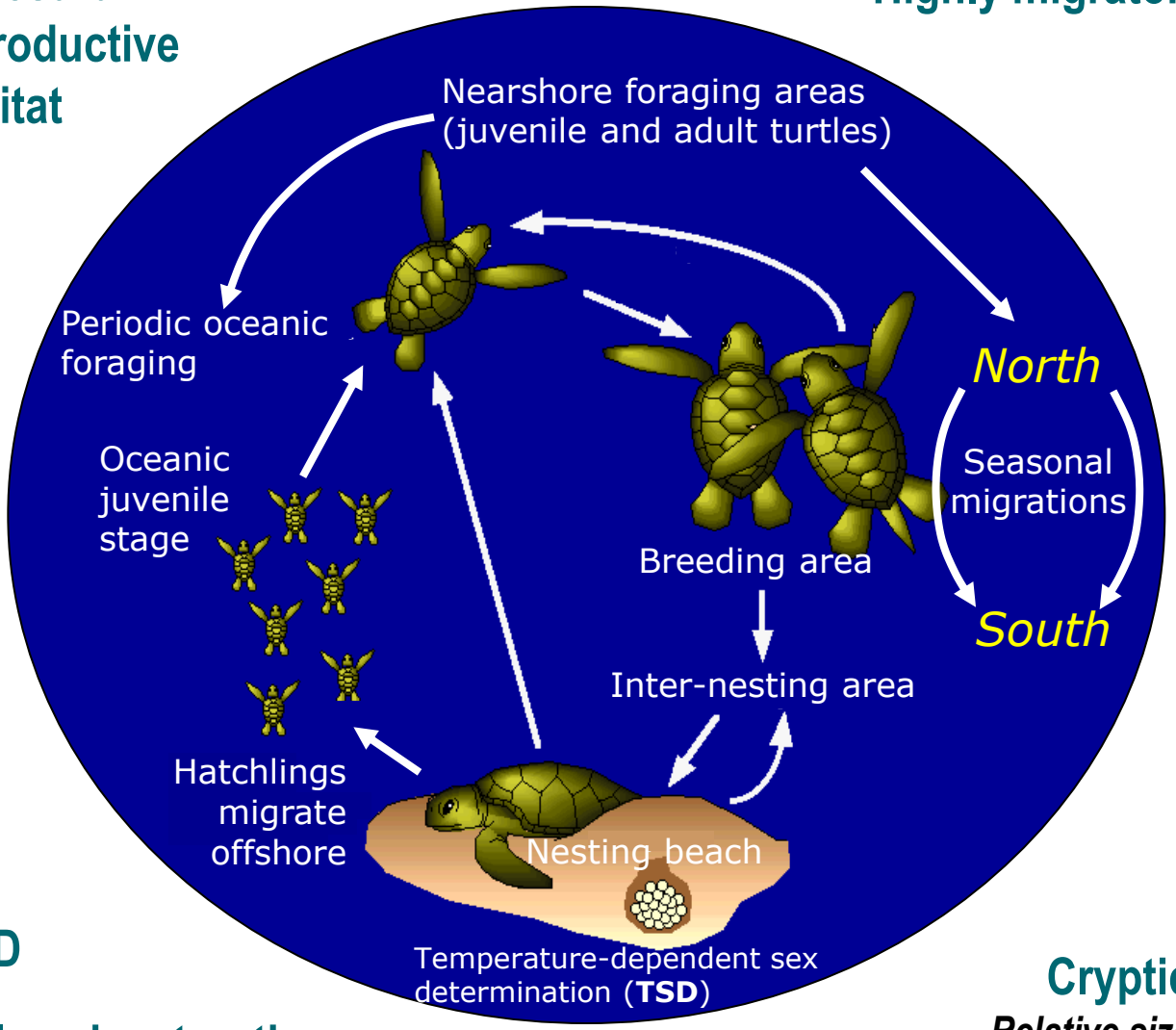
Sea Turtle Data Collection

SEFSC and NEFSC
Sea Turtle Program Staff

August 2015

Terrestrial reproductive habitat

Highly migratory



TSD

Delayed maturation

Cryptic

Relative size

Surfacing behavior

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Guidance for sea turtle data collection efforts

- **Protected Species Stock Assessment Improvement Plan (SAIP)**
- **National Research Council "Assessment of Sea-Turtle Status and Trends: Integrating Demography and Abundance"**
- **NMFS "Sea Turtle Assessment Status and Research Needs"**

Priority information categories

1. Population (stock) identification
2. Life history/vital rates/demographics
3. Abundance
4. Anthropogenic Impacts → Bycatch (Day 2)
5. Assessment frequency and quality → Sea turtle Stock Assessments (Day 2)
6. Ecology

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Primary collaborators: …

1. Population identification

Nesting sites, density, movements, morphometrics

Genetics

- **Sample collection**

  (strandings, bycatch, directed capture)

  (LaCasella et al. 2013)

- **Genetics Expert Working Group support**

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Moderate data
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NOAA FISHERIES

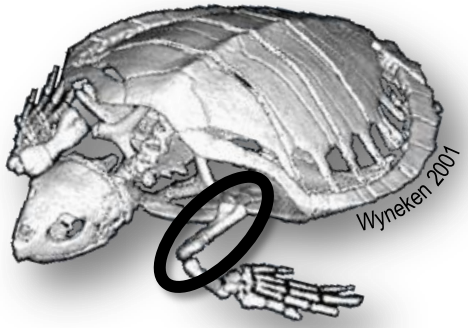
Primary collaborators: NMFS SWFSC National Sea Turtle Genetics Laboratory; University of Florida Archie Carr Center for Sea Turtle Research (ACCSTR)

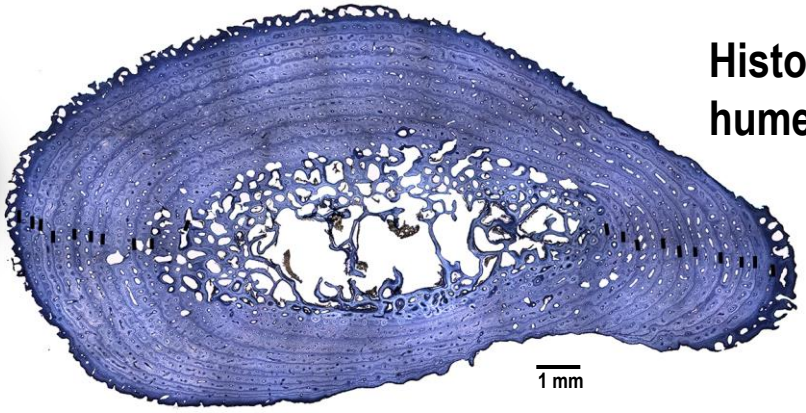
2. Life history/vital rates/demographics

Age and growth

- **Capture-mark-recapture studies** (Braun-McNeill et al. 2008)
- **Skeletochronology** (Avens et al. 2013)

Humerus bone





Histologically-processed humerus cross-section

▬ Skeletal growth mark lateral edges

Modeling early mark deposition patterns to estimate # lost at center

Validating frequency of mark deposition

Validating bone measure:carapace length relationship

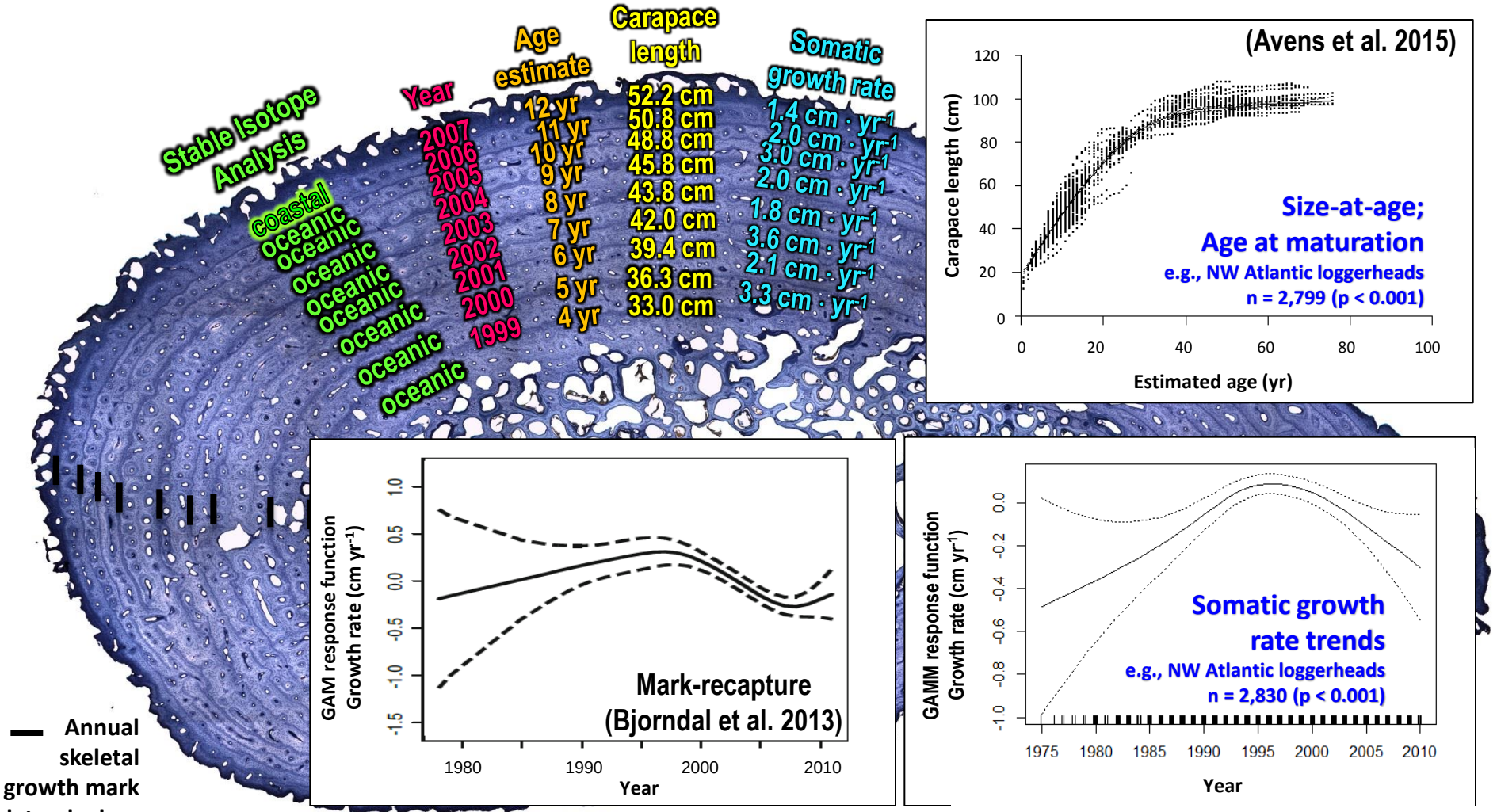
→ **Estimating age**

→ **Back-calculating size-at-age and growth rates**

NOAA FISHERIES

Primary collaborators: National STSSN; NMFS SWFSC; UF ACCSTR; Oregon State University; Universidade Federal do Rio Grande (FURG), BRAZIL; NC Wildlife Resources Commission; NC State University College of Veterinary Medicine

2. Life history/vital rates/demographics



NOAA FISHERIES

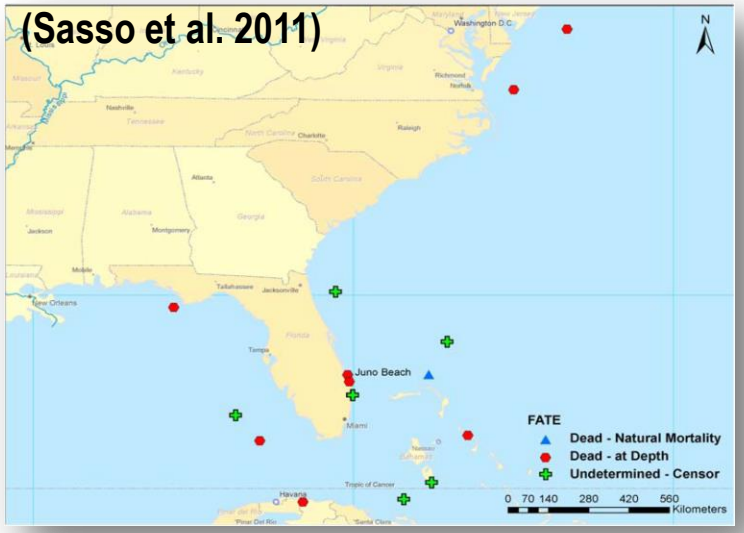
Primary collaborators: National STSSN; NMFS SWFSC; UF ACCSTR; Oregon State University; Universidade Federal do Rio Grande (FURG), BRAZIL; NC Wildlife Resources Commission; NC State University College of Veterinary Medicine

2. Life history/vital rates/demographics

Survival rates

- Capture-mark-recapture studies
  - ***transients*** (Sasso et al. 2006)
- Strandings data (catch-curve analyses)

  (Turtle Expert Working Group 2000)
- Satellite telemetry (PAT tags; known-fate models)
  - ***oceanic juveniles***
  - ***nesting females***



NOAA FISHERIES

Primary collaborators: Chris Johnson; Comité de Protección de Tortugas Marinas en Quintana Roo ; Fisheries and Oceans Canada; F/V Eagle Eye II

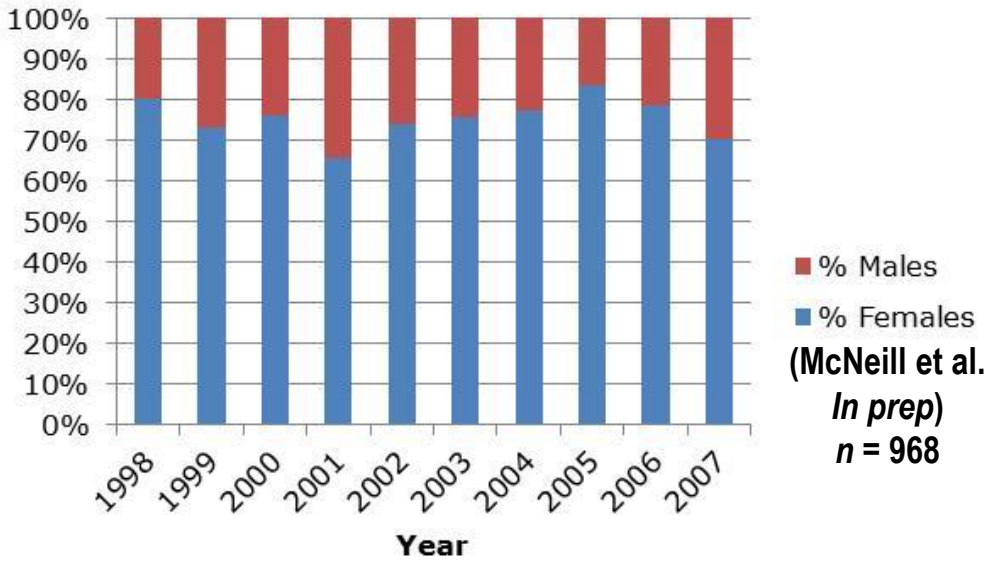
2. Life history/vital rates/demographics

Sex ratios:

- plasma testosterone
- laparoscopy

(Braun-McNeill et al. 2007)

Neritic juvenile loggerheads
Sex ratio - 3F:1M



(McNeill et al. *In prep*)
n = 968

Monitoring population sex ratios:

- variability (life stages, locations)
- long-term trends

NOAA FISHERIES

Primary collaborators: NC State University College of Veterinary Medicine; College of Charleston; NMFS SWFSC; Coonnamessett Farm Foundation; Virginia Aquarium and Marine Science Center

2. Life history/vital rates/demographics

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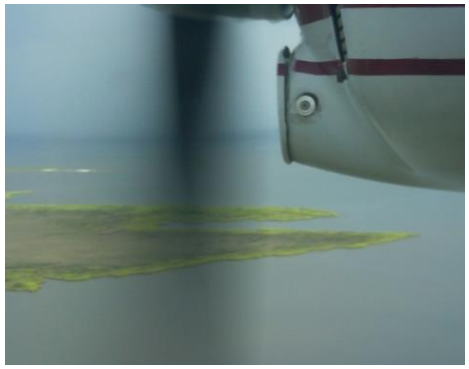
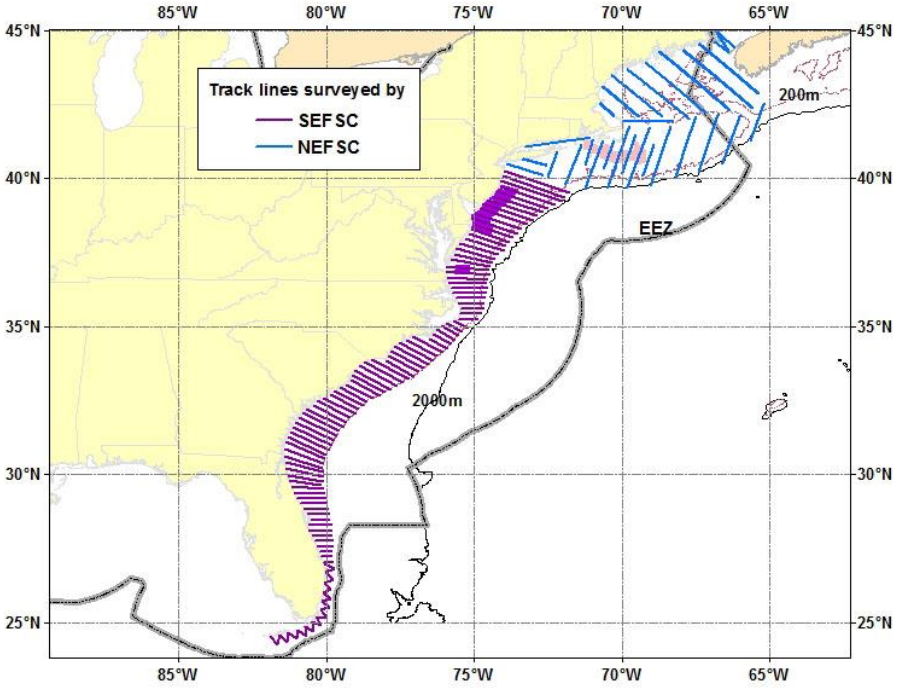
3. Abundance

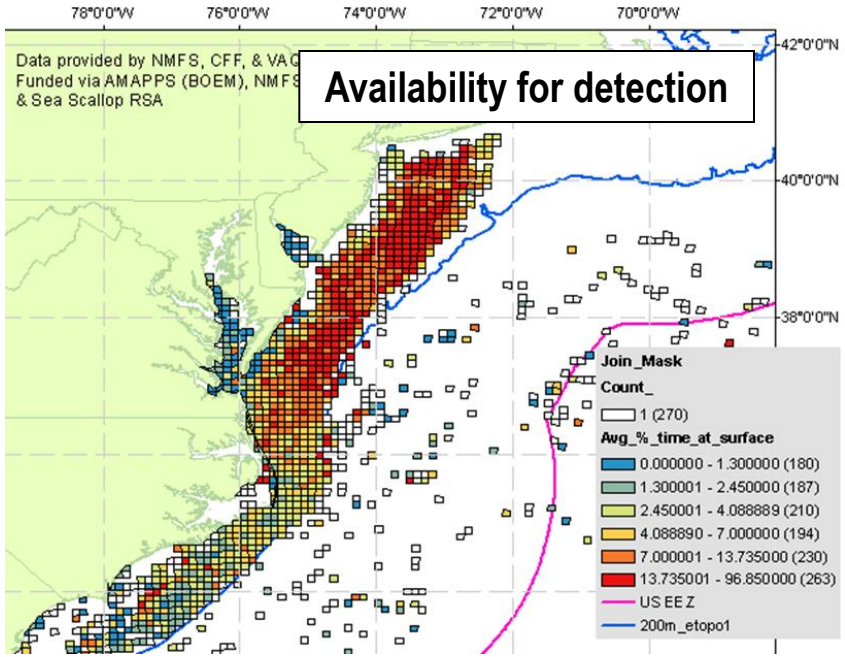
Aerial surveys

AMAPPS

(NEFSC 2011)







NOAA FISHERIES

<u>Primary collaborators</u>: BOEM; Coonamessett Farm Foundation; Centre for Research into Ecological and Environmental Monitoring (CREEM), University of St. Andrews; SC DNR

3. Abundance

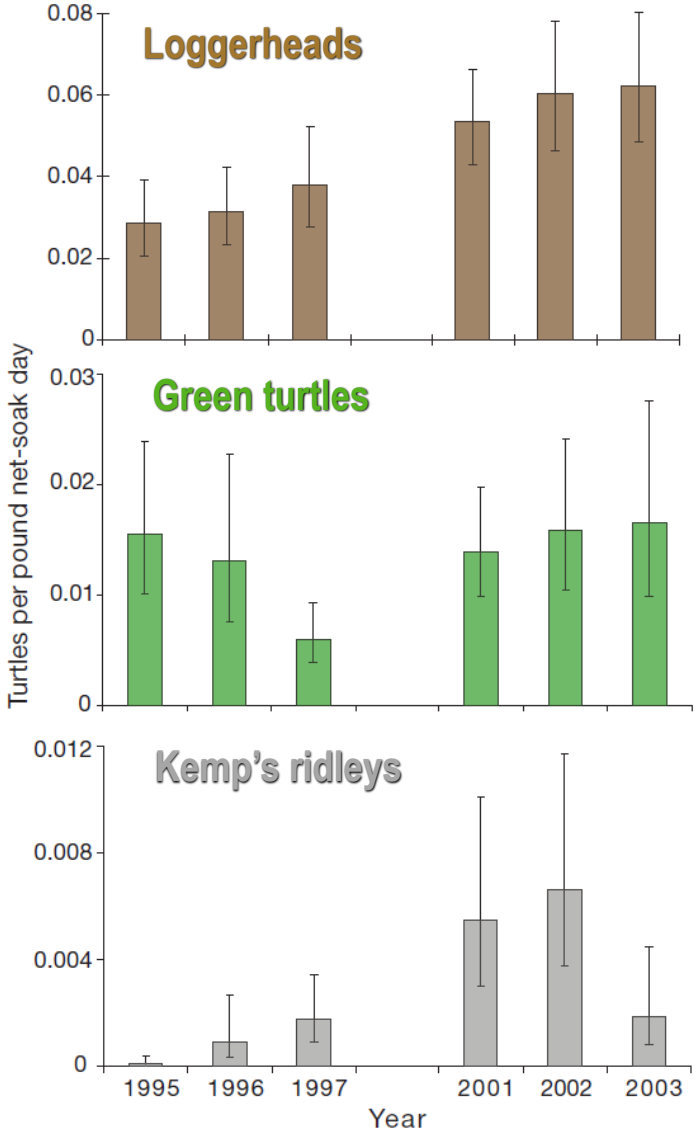
Vessel line transect surveys

Capture-mark-recapture studies

- fishery-dependent (1995 – 2009)
  - *targeted sampling* (Sasso et al. 2007)
  - *trends in catch rates*
- fishery-independent

NC Trends in Catch Rates

Epperly et al. (2007)



NOAA FISHERIES

Primary collaborators: BOEM; NC State University College of Veterinary Medicine; NC Wildlife Resources Commission; NC Maritime Museum

3. Abundance

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4. Anthropogenic impacts

Health assessment

- **Baseline health parameters**

  Hematology

  Plasma biochemistry

  Antibiotic resistance

  Body condition indices

  (Rousselet et al. 2013; Kelly et al. 2015)

Contaminant analysis

- **Tissue studies**

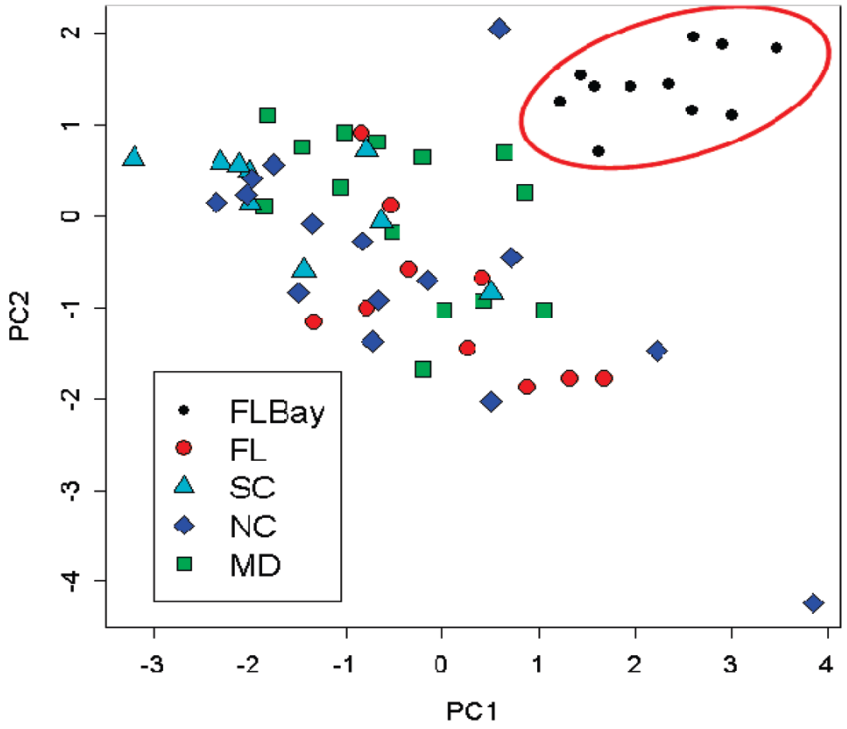
  Biomarkers

  Cell culture development

  (Webb et al. 2014)

- **Contaminants and health**

  (Keller et al. 2004)



- **Spatial and temporal trends**

e.g., Perfluorinated Contaminants (PFCs)

(O'Connell et al. 2010)

NOAA FISHERIES

Primary collaborators: NC State University College of Veterinary Medicine; NC Wildlife Resources Commission; National Institute of Standards and Technology ; UF-Gainesville College of Veterinary Medicine; Texas Tech University

4. Anthropogenic impacts

Health and Contaminants

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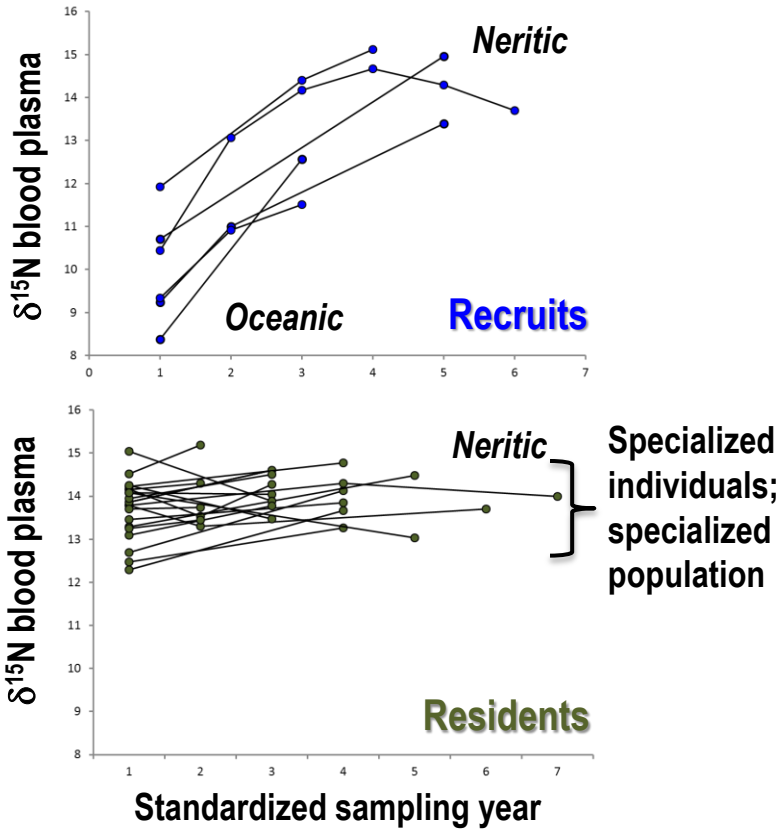
6. Ecology

Stable Isotope Analysis

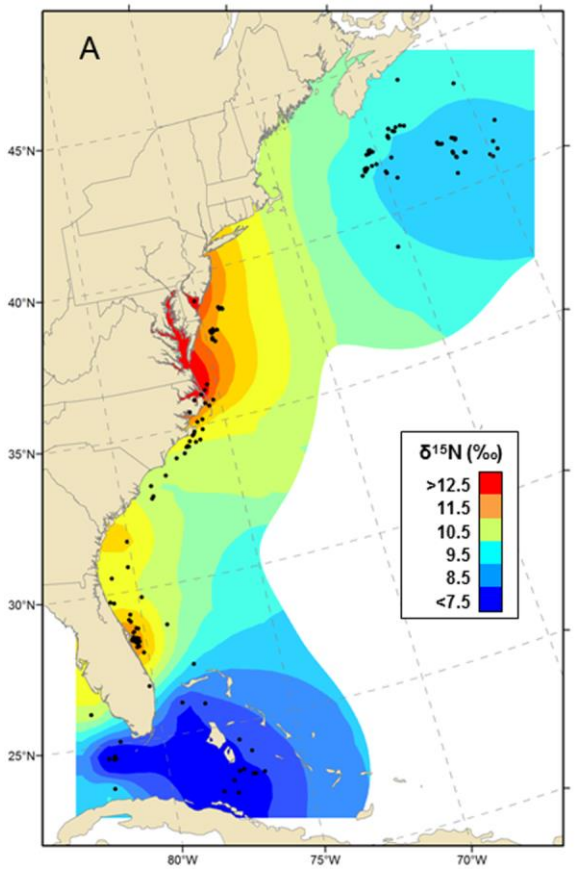
- Habitat shifts
- Trophic niche width and trends



(Goodman Hall et al., *In Press*, MEPS)

+ Telemetry

- Isoscapes



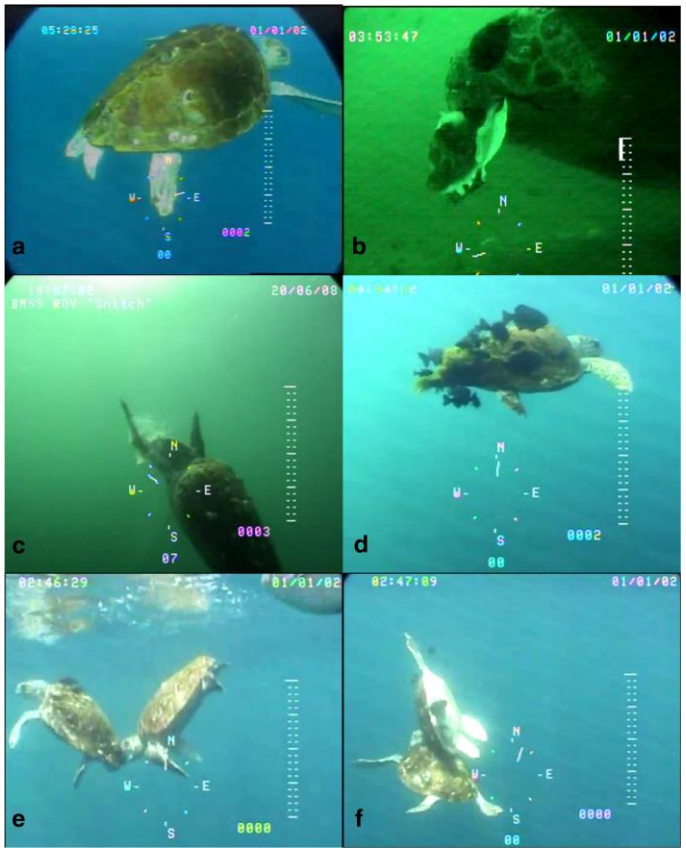
(Ceriani et al. 2014)

NOAA FISHERIES

Primary collaborators: Oregon State University; SWFSC; Duke University; University of Central Florida; FL Fish and Wildlife Research Institute

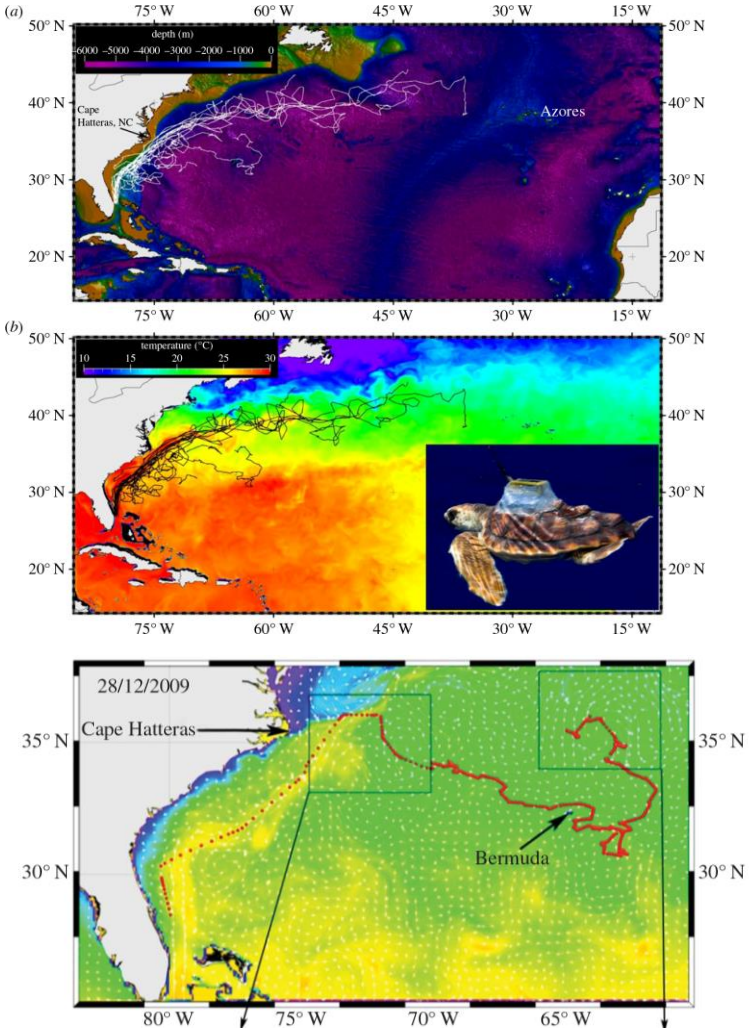
6. Ecology

Behavioral observations (ROV)



(Smolowitz et al. 2015)

Integrating telemetry and environmental data



(Mansfield et al. 2014)

NOAA FISHERIES

Primary collaborators: Coonnamessett Farm Foundation; University of Florida, Ft. Lauderdale Research and Education Center

6. Ecology

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Ecology										

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Opportunistic data collection

Large-scale cold stun events (e.g., FL 2010)

Morphometrics (sex-specific)

Full necropsy

- *determine sex (population sex ratio)* — DEMOGRAPHICS
- *baseline organ weights*
- *evaluate body condition* — ANTHROPOGENIC IMPACTS
- *document anomalies*

Samples collected

- *age and growth estimation (humerus)* — LIFE HISTORY
- *stable isotope analysis (skin)* — ECOLOGY
- *genetics (muscle)* — POPULATION IDENTIFICATION
- *contaminants (muscle, liver)* — ANTHROPOGENIC IMPACTS
- *body condition (liver, fat)*
- *GI tracts (diet analysis)* — ECOLOGY

(Avens et al. 2012)

Primary collaborators: Florida Fish and Wildlife Conservation Commission; NC State University College of Veterinary Medicine; NC Wildlife Resources Commission; NPS

SEFSC and NEFSC Sea Turtle Data Collection

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Challenges

- Biological characteristics
- Geographic scope
- Number of species and life stages

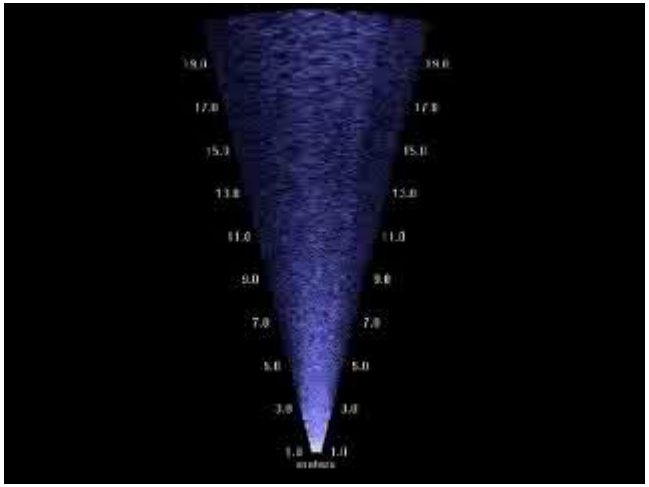
Strengths

- Diverse expertise
- Collaboration
- Innovation

Current developments

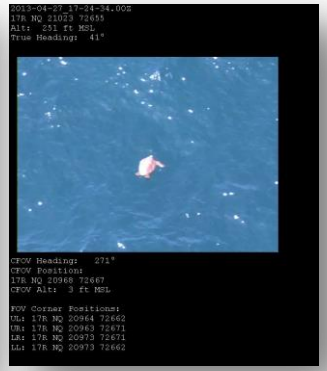
Advanced technologies

Acoustic imaging (Didson, Aris)



AUV-borne side-scan sonar surveys

Small Unmanned Aircraft Systems (sUAS)



NOAA FISHERIES

Primary collaborators: National Ocean Service National Centers for Coastal Ocean Science and Office of Coast Survey; Coonamessett Farm Foundation; NOAA Unmanned Aircraft Systems Program; Fisheries and Oceans Canada

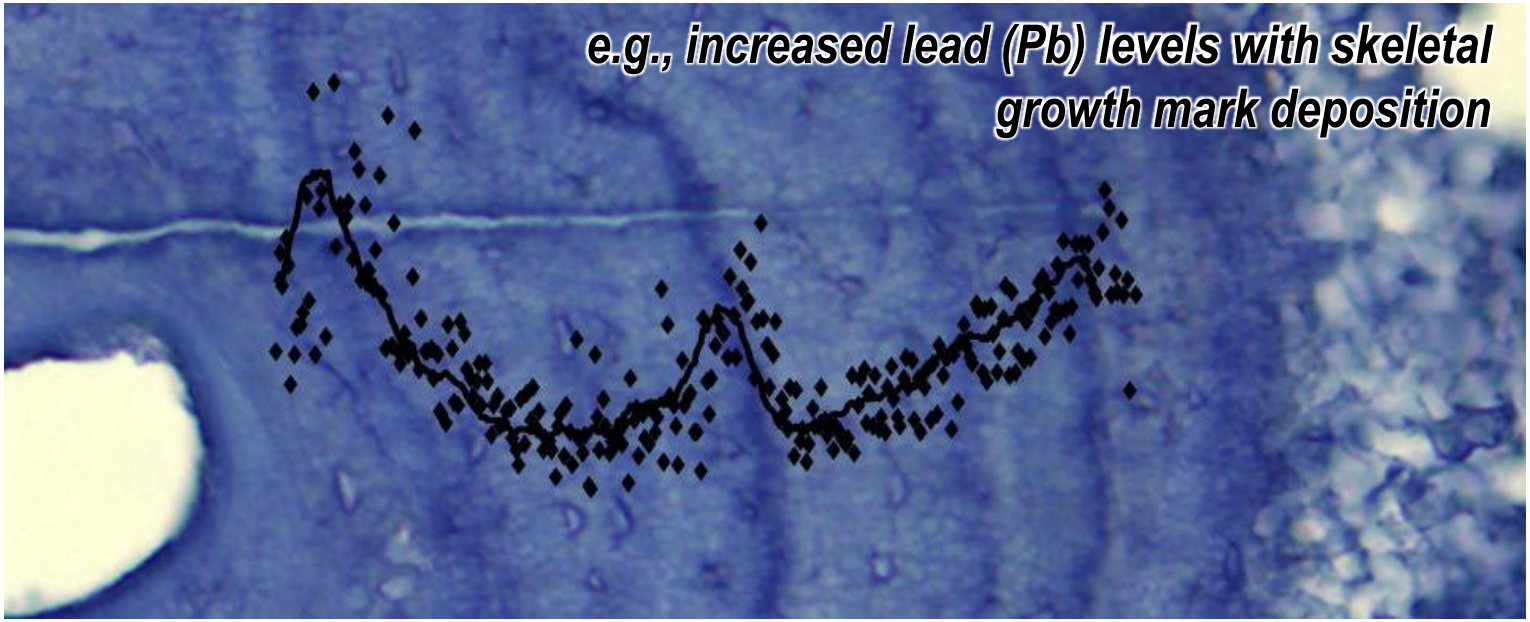
Current developments

Cooperative acoustic receiver arrays

Refined integration of skeletal growth mark, stable isotope & trace element analyses

(laser ablation inductively coupled plasma mass spectrometry; LA-ICP-MS)

start of ablation transect →



NOAA FISHERIES

Primary collaborators: Department of Defense (Marine Corps Air Station Cherry Point); Oregon State University; SWFSC

Discussion Topics

- Is the work we are doing reflective of scientific best practices?
- Do you see an opportunity for SEFSC to shift resources from an existing activity to deal with an unmet need?
- Discuss the major limitations/weaknesses on Sea Turtle research and how they could be resolved?